

# VIA VISION

VOLKSWAGEN GROUP

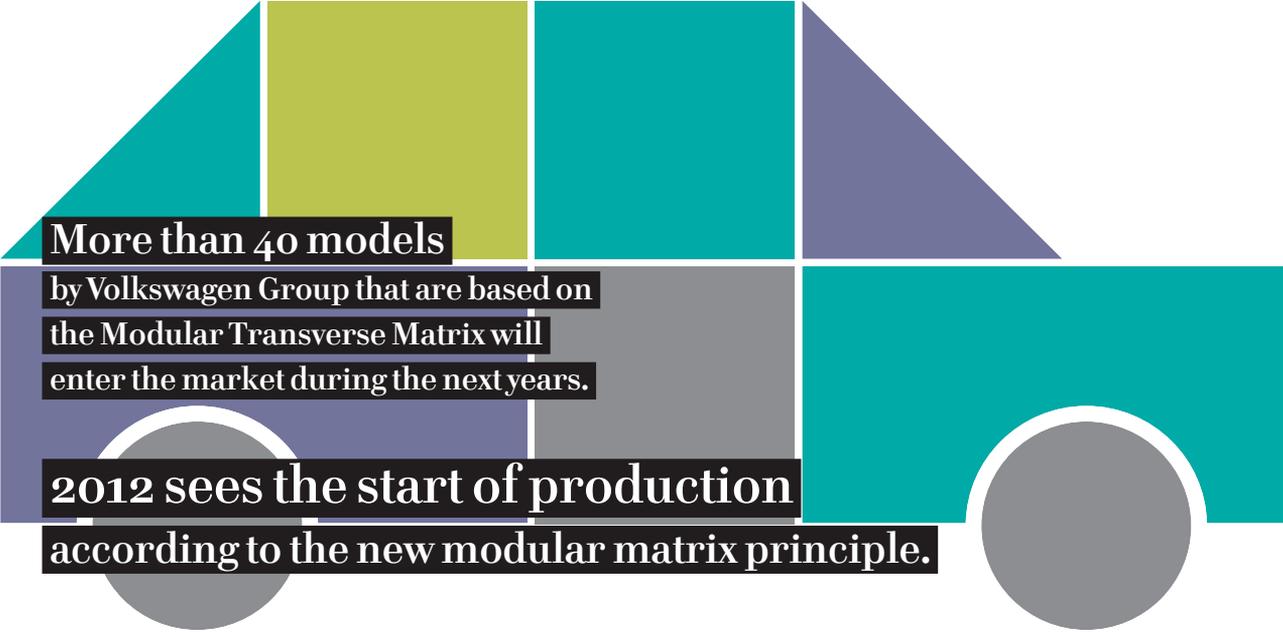
• SHAPING THE FUTURE OF MOBILITY

**NO 02**  
**March 2012**

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## Modular Matrix

### Diversity Through Standardisation



**More than 40 models**

by Volkswagen Group that are based on the Modular Transverse Matrix will enter the market during the next years.

**2012 sees the start of production**

according to the new modular matrix principle.

Editorial



*Dr. Ulrich Hackenberg, Member of the Board of Management of Volkswagen Brand with responsibility for Research and Development.*

As a global automobile manufacturer, Volkswagen is constantly working on making cars and production processes more economical and efficient. A new basis for this is the Modular Transverse Matrix. Find out what stands behind this term on the following pages.

Happy Reading.

# This Is MQB

## Greater Efficiency in Every Way

The business of Volkswagen Group is complex: ten brands, more than 220 models, even more different customisations. At the same time, the Group has made it their business to reduce the consumption of combustion engines, to include natural gas and electric cars in their product line-up and to introduce technical innovations, like assistance systems for example, to as many cars as possible. The basis for the realisation of these goals will be the Modular Transverse Matrix (MQB)\*: a standardised vehicle architecture that allows the combination of different car parts, according to the modular matrix principle, time and time again. This increases the diversity of the product line-up and the efficiency of production, engines and material mix.



Volkswagen Group models that are based on the MQB will enter the market during the next few years.



30 vehicles per hour can be produced on one assembly line in factories that work according to the modular matrix principle. When demand rises, this number can be increased to 60 with the help of additional robots.



20 percent of fuel is saved using the new petrol engines that are part of the MQB. This is made possible by reduced friction resistance in the engines or through active cylinder management for example. Besides the reduction in CO<sub>2</sub>, the focus for diesel engines is on effective emission controls.



40 to 60 kilograms of weight are saved in every car that has been produced using the MQB system. This is achieved by using new means of construction, downsizing of certain engine parts or the use of lightweight materials for example.



20 assistance and infotainment systems that have only been available in the luxury class so far will be installed in MQB models. The Modular Transverse Matrix stands not only for improved economy and efficiency but also for enjoyable driving, comfort and new security systems for the majority of car drivers.

\* Volkswagen Group is the source of all information in this edition.

# Flexible Factory

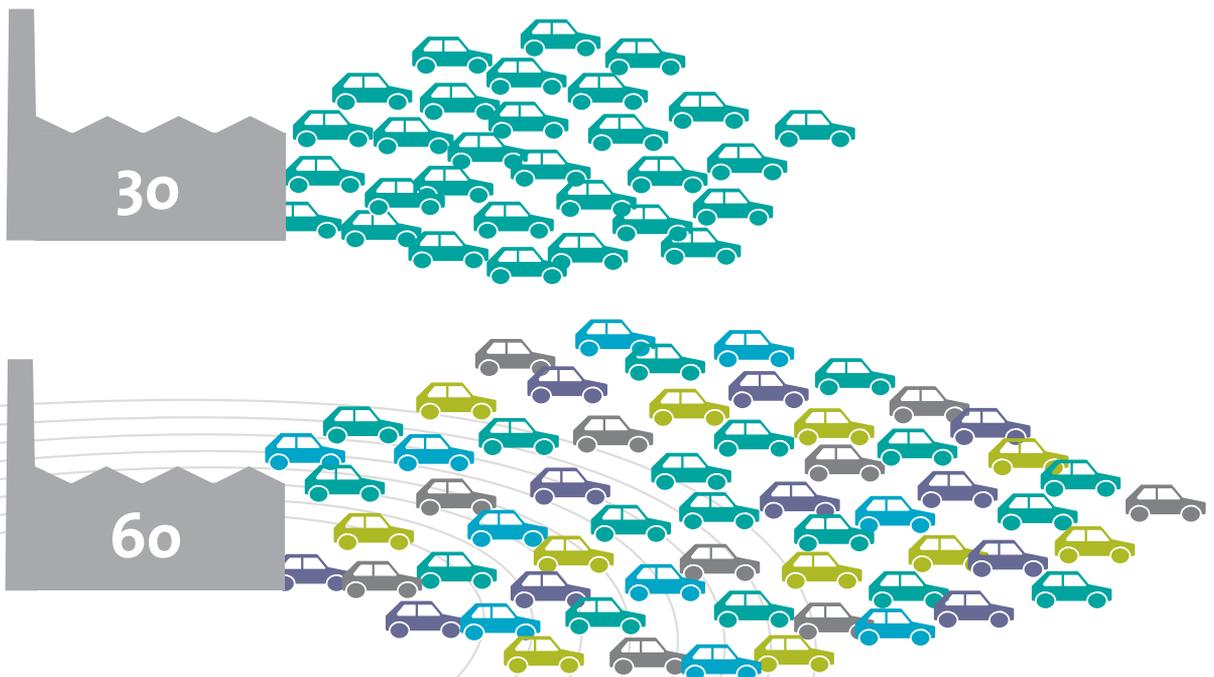
## New Production Standards

More than 90 factories in 22 countries are part of the Volkswagen Group; 8.16 million vehicles were sold in 2011. In order to even better react to increasing demand, and to offer a growing line-up of different models, Volkswagen is also introducing the Modular Production System (MPB) in addition to the MQB. By standardising individual production steps and entire factories, production time and production costs are lowered – on top of that, different brands and models of the Group can leave the same assembly line, for example, the Golf, Tiguan and Passat.

### Application examples

The new Audi A3 and the new Golf will be produced using the MQB. Systems for welding car parts will be standardised for example. A new flexible mobile technology is employed here, that allows the system to be adapted to the differently sized frames and wheelbases of different car models. Also, additional robots at predefined positions can be quickly added in order to increase production figures if need be.

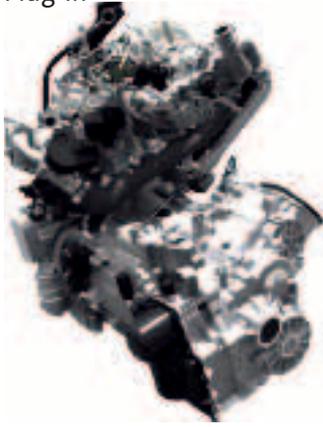
### Output with the Modular Production System: (vehicles per hour)



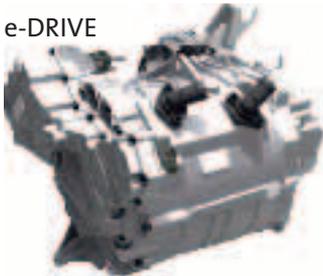
*30 cars per hour can be produced on one assembly line using the basic model of the Modular Transverse Matrix. The flexible system can be expanded with additional robots at predefined positions, if one factory is to produce different models, and can produce up to 60 vehicles of different brands and models.*

**Alternatives**

Plug-In



e-DRIVE



EcoFuel CNG



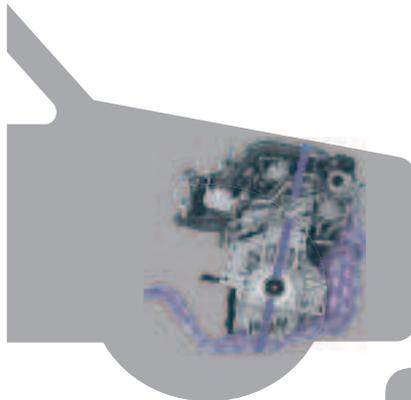
Different drive systems will be installed in the different models without difficulty because of the uniform mounting position in the engine compartment – besides the conventional combustion engine, alternative drives like electric and natural gas engines, too.

# Modular Motor

## More Space and Less Consumption

With the new Modular Transverse Matrix, cars get new engines that are all installed at the same angle of inclination. This has numerous advantages: The new uniform mounting position creates more space in the passenger compartment and drastically reduces the number of engine-gearbox combinations that have to be developed individually. Thanks to the identical mounting position in all models, alternative drive systems can be installed without much effort. Further measures like active cylinder management, for example, reduce consumption and emissions.

**The new position:**



the EA111 engine series in the Golf



all MQB engines

Previously, the exhaust side of the engine block (coloured) was sometimes built into the front and sometimes into the back but is now uniformly positioned at the bulkhead, between the engine compartment and passenger compartment. The engine block itself is now tilted towards the back and not the front. The engine consequently requires 50 millimetres less space, which benefits the passenger compartment. To save even more space, numerous ancillary components, such as the water pump or alternator, are screwed directly into the engine or the oil sump. The new mounting position for petrol and diesel engines will be uniform in order to make standardisation of some parts, like exhaust lines and drive shafts, easier.

### Friction loss wanted

Internal friction, for example that of the pistons against the cylinder walls, costs fuel to overcome. Multiple measures reduce this friction in new petrol and diesel engines. The bearings of the overhead camshafts, piston rods and crankshaft for example are designed to significantly reduce friction.

### Thermal management system

A cold engine consumes more fuel because the engine oil is viscous when cold and consequently increases friction resistance. In addition a cold engine takes longer to heat up the interior. This is why new engines first heat up “stationary” water in the cylinder head. The engine warms up faster, as does the heating. Additionally, the petrol and diesel engines have two separate cooling circuits instead of one large one – in the earlier generations of engines, large cooling circuits not only cooled the overall system but also engine components that are supposed to heat up quickly.

### Emissions control

High nitric oxide emissions present a special challenge for diesel engines. In January 2014, the permitted level of nitric oxide emissions will be lowered from 180 to 80 milligrams per kilometre. To lower these emissions, new diesel engines are fitted – in addition to the existing catalytic converters and particle filters – with storage catalytic converters in small cars, as well as AdBlue injection in larger cars. Storage catalytic converters collect the nitric oxide and convert it into non-toxic substances. With the AdBlue injection, the exhausts are added to an aqueous urea solution which renders the major part of the nitric oxides harmless.

### The bottom line

**20** percent of fuel is saved using new petrol engines with active cylinder management. Otherwise they consume eight to ten percent less fuel, compared to their predecessor engines.

### Cylinder management

While driving at low load states, meaning the lower-to-middle range of engine speed, two of the four cylinders in the petrol engine are shut down. The activation and deactivation of the cylinders takes between 13 and 36 milliseconds, which is unnoticeable to the driver. If the driver presses the accelerator pedal hard, the two cylinders switch back on.

**Reduced consumption:**  
(per 100 kilometres)



at 50 km/h  
in 3<sup>rd</sup>/4<sup>th</sup> gear



at 70 km/h  
in 5<sup>th</sup> gear

*The specified reductions in consumption apply when driving at constant speed. Initially, active cylinder management (ACT) is integrated as standard in the Polo.*

**7** grams less CO<sub>2</sub> per kilometre is emitted by the new generation of diesel engines.

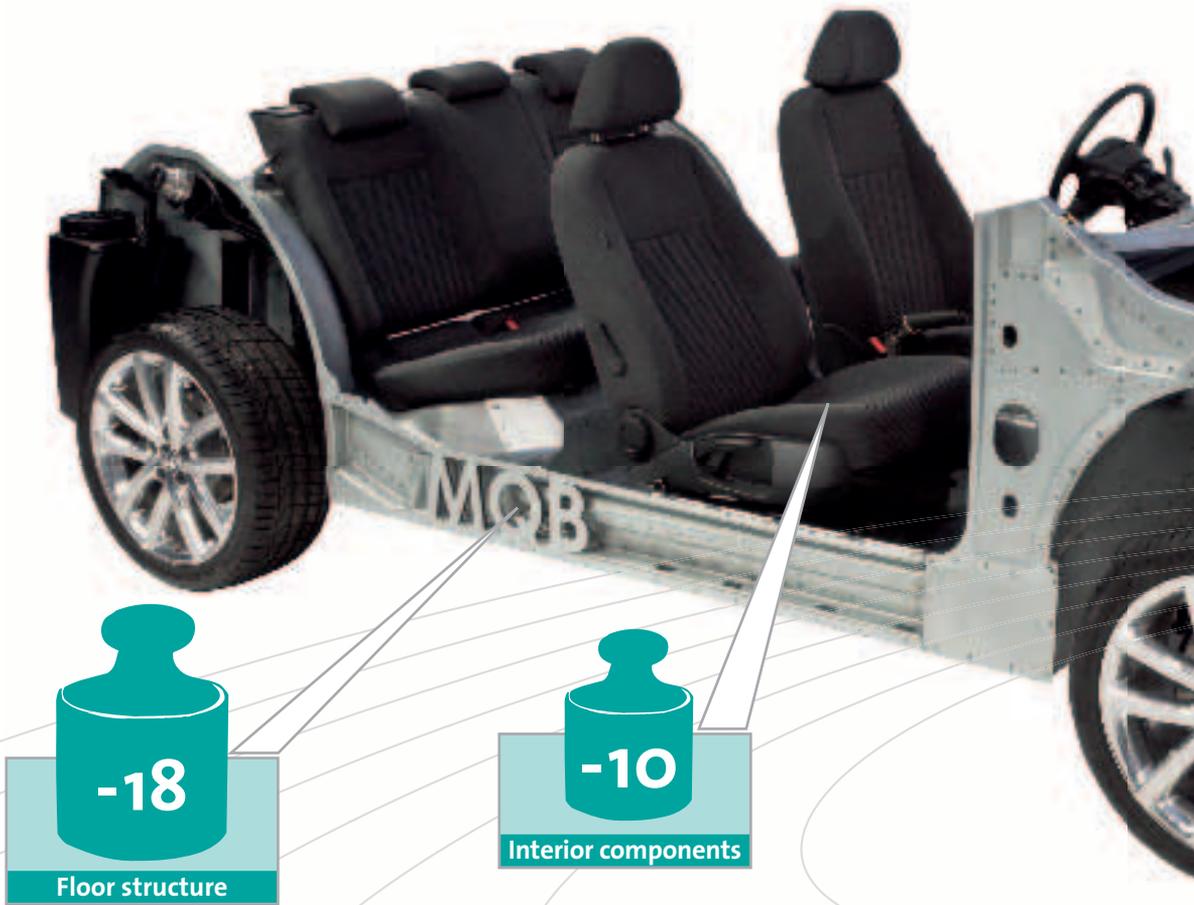
# Slimmed down

## A Basis for Lightweight Standard Production

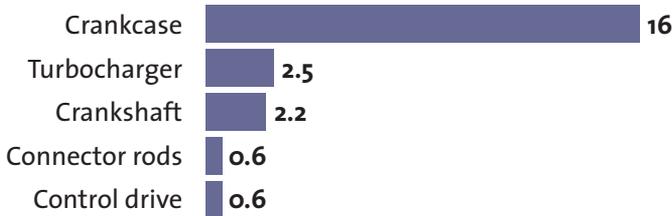
**40** to 60 kilograms less, is what cars in the small, compact and medium class weigh, compared to their predecessor models.

Vehicles have tended to become heavier nowadays because of assistance systems, climate control and other technological advances. The MQB reverses this trend: Almost all parts are optimised in their construction, or made from different material compositions, and are thus significantly lighter. When the new seventh generation Golf rolls off the MQB assembly line this year, it is planned to reach the same weight level as the Golf IV.

**Weight reduction in MQB vehicles:**  
(in kilograms)

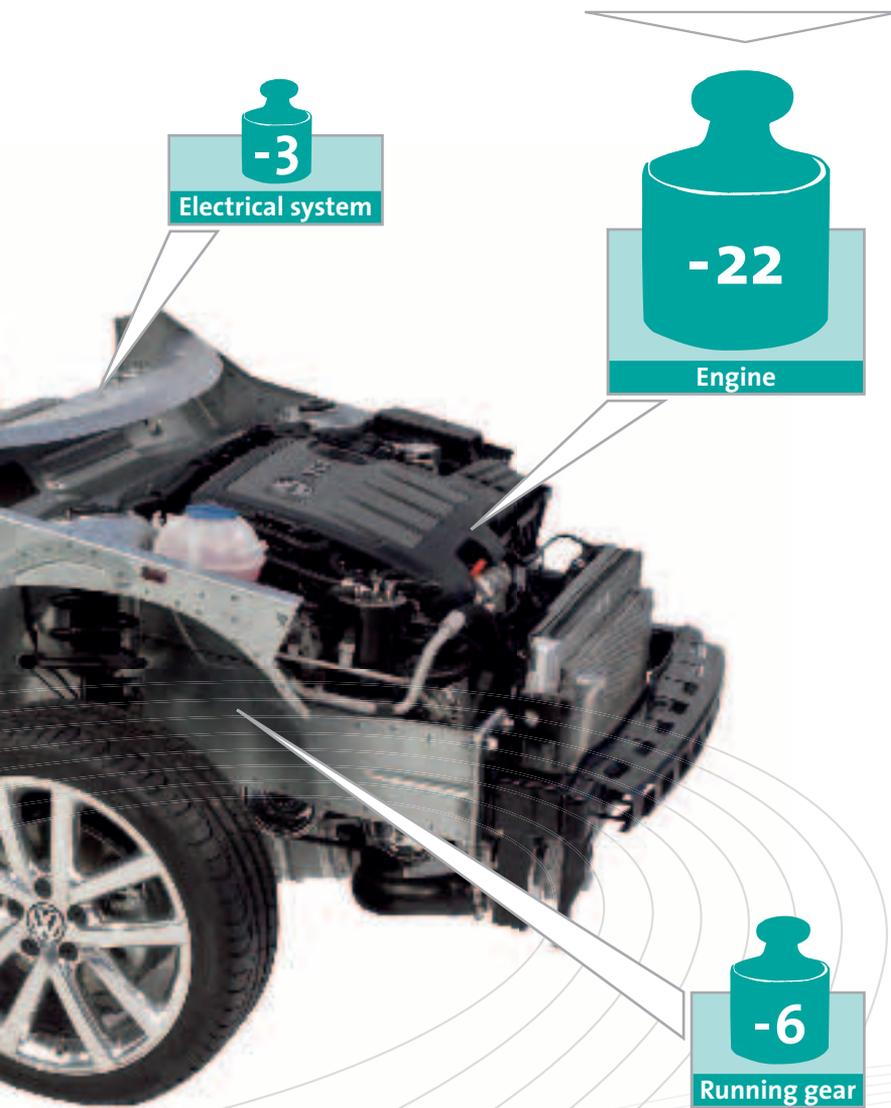


**Weight reduction of engines:**  
(in kilograms)



*The petrol engine\* of 2012 is almost 22 kilograms lighter than its predecessor model of 2008. The lion's share is saved in the crankcase: Because, now the light metal aluminium is employed, it is 16 kilograms lighter than before.*

\*The numbers refer to the petrol engine VW 370 1.4 l 90 kW TSI.



*The vehicles produced with MQB are becoming lighter in many places – without compromising safety or driving comfort.*

*Powertrains and engines lose weight because of the increased use of aluminium. A large proportion of the floor structure consists of hot-formed steels, which are especially light and have improved crash properties. In the interior too, the front and rear seating systems, the load-bearing structure of the dashboard and the air conditioning system are weight-optimised. The electrical system components in the vehicle weigh less as well, thanks to detailed optimisations. Intelligent material selection and improved construction save additional weight in the chassis area, such as shock absorbers, suspension and wheel suspension.*

# As Standard

## Assistance Systems for the Golf Class

Hitherto the latest assistance systems were exclusive to the luxury class. With the Modular Transverse Matrix, 20 different assistance and infotainment systems like traffic sign detection or multicollision brake, which won the first price in Innovation and Environment 2012 by the German car association\*, are being introduced to vehicles of the Golf class. Two systems are premiering with the MQB: the electronically controlled front-axle transverse differential lock and progressive steering.

### Multicollision brake

This is employed when the vehicle is involved in a collision. Because often further collisions happen after the first impact, the multicollision brake automatically decelerates. Still the driver stays in control: Upon acceleration the multicollision brake deactivates.



### Proactive occupant protection system

The system detects a potential accident situation, triggered by hard braking or severe oversteering for example.

It protects passengers by automatically pre-tensioning their belts and closing the windows. Both measures ensure optimal protection.



### Front-axle transverse differential lock

This is new for front wheel drive production vehicles: The electronically controlled front-axle transverse differential lock (VAQ) stabilises front wheel cars during cornering. A special clutch prevents wheel slip on the inside of the curve when turning – bends can be taken more stably and more securely.



### Progressive steering

Progressive steering utilises a steering stroke and a steering rack that are toothed in such a way that the transition between straight line driving and larger steering wheel turning angles is easier to handle. Not only does this improve control over the car but also makes parking more comfortable because the steering wheel requires a smaller turning angle.



\* ADAC, Gelber Engel 2012.

## Imprint

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### Edited by

Volkswagen Aktiengesellschaft  
Konzern Kommunikation  
Brieffach 1972, 38436 Wolfsburg  
Phone: +49 (0)5361/9-77604  
Fax: +49 (0)5361/9-74629

### Vi.S.d.P.

(Person responsible according to the German press law)

Stephan Grühsem, Leiter Konzern Kommunikation;  
Peter Thul, Leiter Kommunikation Marke & Produkt

### Editorial staff

Susanne van den Bergh, Stefanie Hulan,  
Adrienne-Janine Marske, Kathi Preppner, Lena Wilde  
Contact: [redaktion@viavision.org](mailto:redaktion@viavision.org)

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